

REMARKS

The application has been reviewed in light of the Office Action mailed on December 15, 2005. Claim 53 has been amended and new claims 75-86 have been added without adding new matter. Non-elected claims 36-52 and 64-74 have been cancelled without prejudice. Applicants reserve the right to pursue the cancelled claims in other applications.

Claims 53-61 and 63 stand rejected under 35 U.S.C. 102(e) as being anticipated by Collins et al., U.S. Patent No. 5,888,414 ("Collins"). Reconsideration is respectfully requested for the following reasons.

The invention relates to a selective plasma etching process using modulated DC bias to control both deposition and etching at different aspect ratios of a semiconductor integrated circuit, for example. The invention provides an apparatus that improves the process of fabrication of integrated circuits, and operates under a wide range of aspect ratios. Specification, page 11, lines 8-11.

Claim 53 has been amended to recite an apparatus comprising a "bias voltage modulator for modulating a DC bias voltage between a first voltage and a second voltage, wherein at said first voltage material is deposited onto a first location while a second location is etched, and at said second voltage both first and second locations are etched." This is an important feature of the invention.

The specification discloses, for example, that "when bias voltage $|V_{DC}|$ is less than $|V_{DC}(\text{dep})|$, material is etched at a high aspect ratio position ... and a protective material is deposited at a low aspect ratio position When bias voltage $|V_{DC}|$ is greater than $|V_{DC}(\text{dep})|$, material is etched at both low and high aspect ratio positions." Specification, page 16, lines 2-7; Figures 8-10.

Collins fails to teach or suggest this limitation, and amended claim 1 is allowable for at least this reason. Claims 54-61 and 63 depend from claim 53 and contain every limitation of claim 53. Claims 54-61 and 63 are allowable based on the reason for allowance of claim 53, and also because the unique combinations recited in the dependent claims are neither taught nor suggested by Collins. For example, claim 59 recites that the "bias voltage modulator has a duty cycle of from about 10% to about 90%." Collins fails to teach or suggest this limitation, and this is an additional reason for allowance of claim 59.

Claim 62 stands rejected under 35 U.S.C. § 103 as being unpatentable over Collins in view of Hashimoto et al., U.S. Patent No. 5,779,925 ("Hashimoto"). Reconsideration is requested. Claim 62 depends from claim 53 which is allowable over Collins as discussed above. Hashimoto adds nothing to Collins to remedy its deficiencies with respect to claim 53. Thus, claim 62 is allowable together with its base claim.

New claims 75-86 have been added, of which claims 75 and 81 are independent claims. Claim 75 recites, inter alia, a "bias voltage modulator for modulating a DC bias voltage between a first voltage and a second voltage while processing a substrate having an opening." According to claim 75, the "modulator is adapted to modulate voltage such that material is deposited at a first position of said opening which has a first aspect ratio, while a second position of said opening having a second aspect ratio, different from said first aspect ratio, is etched." New claims 76-80 depend from claim 75.

Claim 81 recites, inter alia, a "bias voltage modulator for modulating a DC bias voltage between a first voltage and a second voltage while etching a self-aligned contact opening." Claim 81 further recites that the "voltage modulator is adapted to

control deposition of material at a first position of said opening which has a first aspect ratio, while etching a second position of said opening which has a second aspect ratio."

Claims 82-86 depend from claim 81.

Support for claims 75 and 81 can be found, for example, on page 16, lines 1-5 of the specification, wherein it is disclosed that , "when bias voltage $|V_{DC}|$ is less than $|V_{DC}(\text{dep})|$, material is etched at a high aspect ratio position (such as position C as shown in Figs. 8-10 below) and a protective material is deposited at a low aspect ratio position (such as position A as shown in Figs. 8-10 below)." Support for claims 76-80 and 82-86 can be found, for example, on page 11, lines 15-21 of the specification.

In view of the above amendment and remarks, Applicants believe that the pending claims are in condition for allowance.

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